

A Rationale for Math Coaching

Previous mathematics professional development in Todd County did not focus on individual teacher needs, given that training was usually provided in large groups. As a result, teachers sometimes did not readily adopt the strategies or techniques due to a lack of full understanding and/or follow-up guidance for how to do so. Teachers need coaching with a mathematics emphasis to help improve their pedagogy and the ways they can engage more students into mathematics learning.

The goal of Todd County's content coaching is to develop mathematics leaders and teachers with strong mathematical and pedagogical content knowledge that translates into improved instructional practice and better student learning.

Todd County's theory of academic coaching is based on our belief that the key to improving student achievement is improving instruction through intensive hands-on professional development for teachers.

One format for delivering such intensive hands-on professional development for teachers is the weekly or bi-weekly classroom visit from a trained math coach. Their role includes the use of a variety of strategies to engage teachers in revising their practice, including modeling and team-teaching. The main task of the coach is to get teachers to focus on student thinking and mathematical pedagogy. The coach works with teachers in and out of the classroom on analyzing student work, reviewing and exploring mathematical concepts, reviewing and revising lesson plans, and reflecting on a lesson after the coach's observation.

Each coach will work with up to 20 individual math teachers throughout the year. Fifteen of those teachers will receive bi-weekly visits. Each math coach will select 5 of the 20 teachers, with seasoned classroom teachers being the most likely candidates, with whom they will work most closely during the school year (one visit per week). Since these teachers have some experience, the coaches can work on deepening the teachers' mathematics knowledge and teaching skills, rather than getting sidetracked with more basic skill development. The following year, then, this stable of teachers will act as the "veterans of the locker room" in seeding buildings and PLCs with experience and mentorship. The goal is to develop a self-renewing and self-sustaining community of highly effective mathematics educators.

Coaches meet as a group at least bi-weekly throughout the academic year. These meetings provide professional development for the coaches so they are continually expanding their own repertoire of skills. Coaches use these meetings to share ideas about mathematics content, teaching strategies, and learning theory. They can also focus on administration and analyses of performance exams, address issues with administrative policies, or analyze specific mathematics lessons.

Todd County is a school district blessed with diversity. Although often seen as problematic, we believe that our many schools, some large, some small, offer rich and varied resources from which all others can benefit. Therefore, we envision coaching practices designed to reap the

benefits of diversity, rather than wither in the shadow of segregation. Math coaches will best serve the needs of the district by themselves being “ambassadors” of best practices between outlying school and town school, between elementary school and high school, between grade 5 and grade 7.

It is therefore critical to our vision that coaches not be “based” at one particular school. Rather, each coach will work with a “set” of schools. Each set including outlying school, town school, and middle school or high school.

Building teacher capacity is key in Todd County’s vision of coaching. The Office of Curriculum and Instruction wants the coaches to encourage teachers to adopt new frameworks for thinking about their students’ mathematics learning; this will help teachers learn to assess their own instructional practices and make changes where needed. To accomplish this, coaches encourage teachers to reflect on their practices and ask the teachers open-ended questions to keep them focused on specific goals. This type of questioning models for teachers how to assess their own practices. If a teacher has a misconception about aspects of the content, the coach can help the teacher reflect upon this in their meetings by having the teacher use logical arguments to derive correct mathematical understanding of different ideas. Teachers can then use this same technique with their students who are struggling with competing rationales for understanding math concepts.

Supporting Evidence

The Silicon Valley Mathematics Initiative in California has been operating under a similar model for mathematics coaching . Their results are very, very promising.

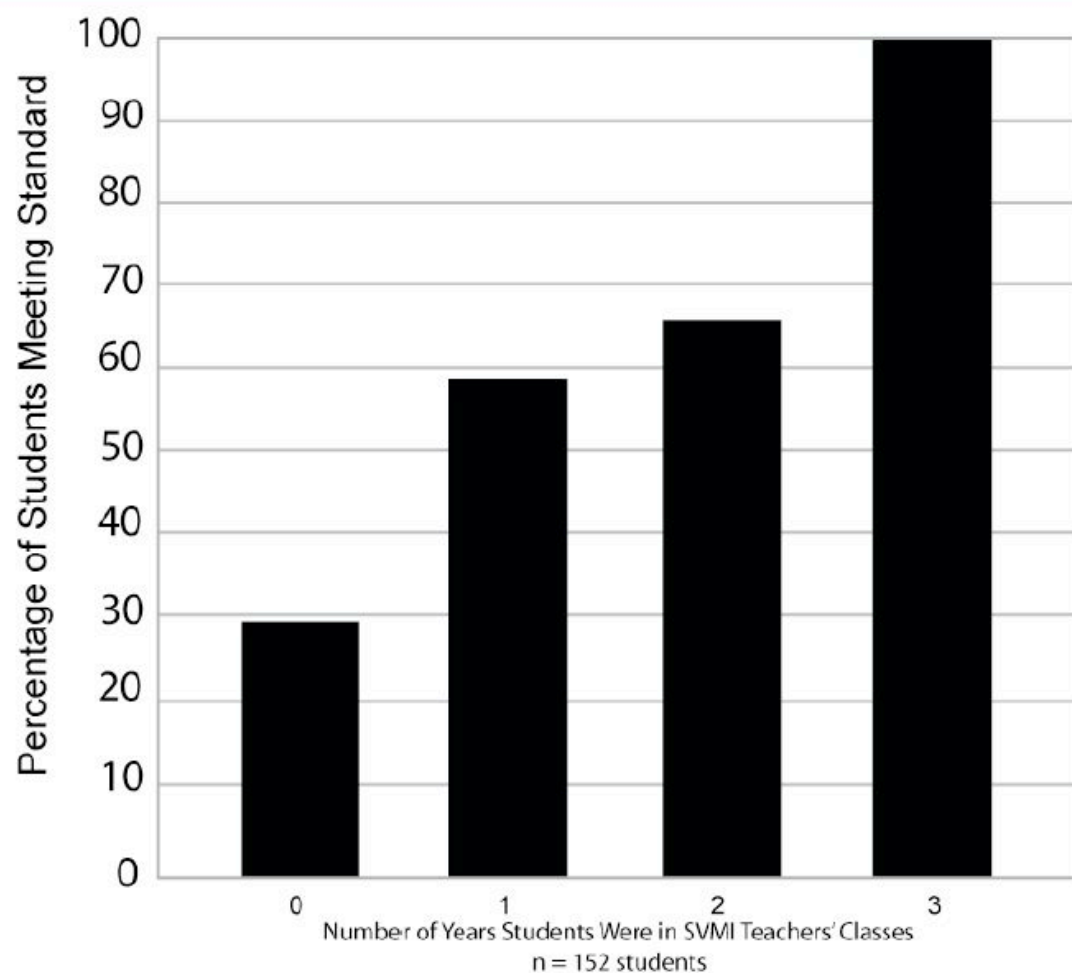
Not only do there appear to be changes in teachers’ practices, but these changes also appear related to improvements in student learning. Table 1 shows the pass rates on California’s large-scale assessment test in mathematics, the California Standards Test (CST). In the table, the treatment group includes 33 teachers who had intensive SVMI coaching, and a control group includes 51 teachers who did not. Teachers who engaged in professional development through SVMI coaching had a higher percentage of students passing the CST than those who did not. Although the difference between the two groups for grade 6 is minimal, the results for grades 7 and 8 and for Algebra I are significant.

Table 1. Pass Rates on the Mathematics Portion of the California Standards Test (CST)

Grade/Course	Percentage of the Non-SVMi Coached Group’s Students Passing	Percentage of the SVMi Coached Group’s Students Passing
6	42	44
7	29	49
8	15	25
Algebra I	52	70

In addition, the longer students were involved in classrooms with teachers who had SVMI coaches, the more likely they were to meet the standards on the Mathematics Assessment Resources Service (MARS) exam. The MARS exam is a performance assessment at each grade level, made up of five tasks. These five tasks assess concepts and skills at each grade level in addition to problem solving, reasoning, and communication skills. Teachers are involved in scoring these performance assessments and talking about the depth of student learning as part of their professional development. Practices Worthy of Attention Silicon Valley Mathematics Initiative Charles A. Dana Center at the University of Texas at Austin 4

Figure 1 shows the performance of a cohort of 152 students in grades 4–7 on MARS taught by SVMI teachers. Before coaching began, only 30% of students met the standards, compared with almost 100% of students who were in classrooms with SVMI teachers for three years.



**Figure 1. Percentage of Students Passing MARS
Based on Length of Time in SVMI Classrooms**

Many Bridges, One Goal

	Klein	Hedog	Lakeview	Littleburg	North	Okreek	Rosebud	Springcreek	South	Middle School	High School
K-2	Coach 1	Coach 3	Coach 3	Coach 4	Coach 3	Coach 2	Coach 1	Coach 3			
3-5	Coach 1	Coach 2	Coach 3	Coach 4	Coach 2	Coach 2	Coach 3	Coach 3	Coach 1 Coach 4		
6-8	Coach 1		Coach 3	Coach 4		Coach 2		Coach 3		Coach 1 Coach 2 Coach 4	
9-12											Coach 2 Coach 4

Potential Model of Coaching Placements